

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of:	Atty. Docket No.:	006389.00002	
Steven A. Rogers			
Serial No.:	10/663378	Group Art Unit:	2616
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For:	Empirical Scheduling of Network Packets	Confirmation No.:	2690

APPEAL BRIEF

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Sir:

This is an appeal brief filed in support of Appellant's June 20, 2008 Notice of Appeal. Appeal is taken from the final office action mailed June 17, 2008.

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REAL PARTY IN INTEREST

37 C.F.R. § 41.37(c)(1)(i)

The owner of this patent application, and the real party in interest, is Rivulet Communications, Inc.

RELATED APPEALS AND INTERFERENCES

37 C.F.R. § 41.37(c)(1)(ii)

There are no related appeals or interferences.

STATUS OF CLAIMS

37 C.F.R. § 41.37(c)(1)(iii)

Claims 1 and 3-37 are pending and stand rejected. Claim 2 has been canceled. Appellant hereby appeals the rejection of claims 1 and 3-37.

STATUS OF AMENDMENTS

37 C.F.R. § 41.37(c)(1)(iv)

No amendments were filed after the final rejection mailed on June 17, 2008.

SUMMARY OF CLAIMED SUBJECT MATTER

37 C.F.R. § 41.37(c)(1)(v)

In making reference herein to various embodiments in the specification text and/or drawings to explain the claimed invention, Appellant does not intend to limit the claims to those embodiments; all references to the specification and drawings are illustrative unless otherwise explicitly stated.

Aspects of the invention relate generally to reducing or eliminating packet contention in a network, such as a packet-switched network. A transmitting node or endpoint (FIG. 2, element 100) having the need to transmit data packets to an intended receiving node or endpoint (FIG. 2, element 103) through intervening network elements (FIG. 2, routers 104 through 107) partitions a packet delivery schedule into a plurality of delivery times or “time slots” (FIG. 5 step 502; page 3 line 24 to page 4 line 1). The transmitting node then transmits a series of test packets over the network to the intended recipient using different time slots (FIG. 5 step 504; page 3 line 24 to page 4 line 1; FIG. 6 “test packets”). The test packets are evaluated to determine which of the delivery times (time slots) suffered the least latency and/or packet loss, and those time slots are used to transmit the packets for the duration of the transmission (FIG. 5 steps 505 and 506; page 4 lines 1-3). Different priority levels can be used to transmit the test packets, so that they do not interfere with existing network traffic (FIG. 3, discovery level 122; page 4 line 6; page 5 lines 2-8; page 8 lines 22-24). Using the inventive principles, real-time network traffic can be assured of reliable delivery even when packet switch queues become full or nearly-full for some types of network traffic (FIG. 7).

Independent Claim 1

Independent claim 1 recites a method (FIG. 5) of transmitting packets over an Internet Protocol (IP) or Ethernet packet-switched network (FIG. 6, IP network), comprising the steps of:

(1) transmitting a plurality of test packets over the network during a plurality of different time slots (FIG. 5 step 504, FIG. 6; page 3 line 24 to page 4 line 1), wherein each test packet has a priority level that is lower than a priority level assigned to data packets that are to be transmitted between endpoints on the network (FIG. 3, discovery level 122; page 7 lines 8-10), and wherein the test packets are transmitted so as to emulate data packets that are to be transmitted between the endpoints on the network (page 6 lines 7-11; page 7 lines 7-8);

(2) on the basis of step (1), evaluating which of the plurality of different time slots corresponds to favorable network traffic conditions (FIG. 5 step 505, page 4 lines 1-3; page 7 lines 23-24); and

(3) transmitting data packets over the network at a priority level higher than the test packets using one or more favorable time slots evaluated in step (2) (FIG. 5 step 506; page 8 lines 20-25)

Dependent Claim 9

Dependent claim 9 recites: The method of claim 8, wherein the IP packets are scheduled for transmission within time slots within a frame that is synchronized to a clock (FIG. 4 frames; FIG. 6 GPS; page 5 lines 15-25; page 6 lines 17-27; page 8 lines 26-28).

Dependent Claim 10

Dependent claim 10 recites: The method of claim 1, wherein the test packets are transmitted at a priority level that is lower than the data packets in step (3), but higher than other data packets containing other data transmitted on the network (FIG. 3, real-time level 121, discovery level 122, and data level 123; page 4 lines 15-16; page 5 lines 2-10).

Independent Claim 15

Independent claim 15 recites: In an Internet Protocol (IP) or Ethernet network comprising a plurality of packet switches (FIG. 7), a method of transmitting data packets (FIG. 5), comprising the steps of:

(1) establishing a time reference frame comprising a plurality of time slots during which packets are to be transmitted across the network between two network endpoints (FIG. 4; FIG. 5 step 502; page 6 lines 17-27);

(2) from a first network endpoint, empirically determining which of the plurality of time slots is associated with a reduced level of packet contention with respect to an intended second network endpoint (FIG. 2 endpoints 100 and 103; FIG. 5 step 505; FIG. 6; page 4 lines 1-9; page 5 lines 25-27; page 7 lines 23-24); and

(3) synchronously transmitting a plurality of data packets from the first network endpoint to the second network endpoint during one or more time slots empirically determined to be associated with the reduced level of packet contention in step (2) (FIG. 5 step 506; FIG. 6 – GPS; page 8 lines 20-28).

Dependent Claim 17

Dependent claim 17 recites: The method of claim 16, wherein step (2) comprises the step of transmitting the test packets using a packet priority level lower than a packet priority level used to transmit the plurality of data packets in step (3) (FIG. 5 step 506; page 8 lines 20-25).

Dependent Claim 18

Dependent claim 18 recites: The method of claim 17, wherein step (2) comprises the step of transmitting test packets at a data rate sufficient to support a desired bandwidth in step (3) (page 6 lines 7-11; page 7 lines 7-8).

Independent Claim 19

Independent claim 19 recites: An apparatus having a network interface and programmed with computer-executable instructions that, when executed, perform the steps of (FIG. 2 endpoint 100; FIG. 6 endpoints; page 3 lines 24-26; page 10 lines 13-25):

(1) transmitting a plurality of test packets at a first priority level, wherein the test packets are transmitted at a data rate that emulates data packets that are to be transmitted between endpoints on the network (FIG. 3 discovery level 122; FIG. 5 step 504; page 6 lines 7-11; page 7 lines 7-8);

(2) on the basis of step (1), evaluating which of the plurality of different time slots corresponds to favorable network traffic conditions (FIG. 5 step 505; FIG. 6; page 4 lines 1-3; page 7 lines 23-24); and

(3) transmitting data packets over the network at a second priority level using one or more favorable time slots evaluated in step (2), wherein the second priority level is higher than the first priority level (FIG. 3 real-time level 121; FIG. 5 step 506; page 8 lines 20-25).

Dependent Claim 27

Dependent claim 27 recites: The apparatus of claim 26, wherein the IP packets are scheduled for transmission within time slots within a frame that is synchronized to a clock (FIG. 4 frames; FIG. 6 GPS; page 5 lines 15-25; page 6 lines 17-27; page 8 lines 26-28).

Dependent Claim 28

Dependent claim 28 recites: The apparatus of claim 19, wherein the test packets are transmitted at a priority level that is lower than the data packets in step (3), but higher than other data packets containing other data transmitted on the network (FIG. 3, real-time level 121, discovery level 122, and data level 123; page 4 lines 15-16; page 5 lines 2-10).

Independent Claim 31

Independent claim 31 recites: A system comprising at least three network endpoints that contend for resources in a shared packet switch, each endpoint comprising a processor programmed with computer-executable instructions that, when executed, perform steps including (FIG. 2 endpoints 100-103; FIG 7 packet switch 704; page 10 lines 3-6 and 13-25):

(1) transmitting a plurality of test packets over the network during a plurality of different time slots, wherein each test packet has a priority level that is lower than a priority level assigned to data packets that are to be transmitted between endpoints on the network, and wherein the test packets are transmitted so as to emulate data packets that are to be transmitted between the endpoints on the network (FIG. 3 discovery level 122; FIG. 5 step 504; FIG. 6; page 3 line 24 to page 4 line 1; page 6 lines 7-11; page 7 lines 7-10);

(2) on the basis of step (1), evaluating which of the plurality of different time slots corresponds to favorable network traffic conditions (FIG. 5 step 505; page 4 lines 1-3; page 7 lines 23-24); and

(3) synchronously transmitting data packets over the network using one or more favorable time slots evaluated in step (2) (FIG. 5 step 506; FIG. 6 -- GPS; page 8 lines 20-28).

Independent Claim 37

Independent claim 37 recites: A method of transmitting packets over an Internet Protocol (IP) network comprising a plurality of network switches (FIG. 2 routers 104 to 107; FIG. 5; FIG. 7 packet switches 703-705), comprising:

(1) establishing a time reference frame comprising a plurality of time slots corresponding to candidate times during which packets may be transmitted between network endpoints on the network (FIG. 4; FIG. 5 step 502; FIG. 6 – numbered time slots at bottom of figure; page 3 line 22 to page 4 line 2; page 5 lines 15-27);

(2) transmitting over a plurality of the time slots a plurality of test packets from a first endpoint on the IP network to a second endpoint on the IP network, wherein the plurality of test packets are transmitted at a first priority level and are transmitted at a data rate corresponding to an expected rate to be experienced during a subsequent communication between the first and second endpoints on the IP network (FIG. 3 discovery level 122; FIG. 5 steps 503 and 504; page 6 lines 7-11; page 7 lines 7-10),

(3) evaluating, at one of the first and second endpoints, packet statistics for the test packets, wherein the packet statistics are indicative of contention conditions in one or more of the plurality of network switches (FIG. 5 step 505; FIG. 7 packet switch 704; page 4 lines 1-3; page 7 lines 23-30),

(4) identifying one or more time slots that correspond to a low level of contention conditions (FIG. 5 step 505; page 4 lines 1-3; page 7 lines 23-30; page 10 lines 3-12); and

(5) synchronously transmitting based on the time reference frame a plurality of data packets comprising one or more of voice data, video data, and TDM-over-IP data during the one or more of the time slots identified in step (4) that correspond to the low level of contention conditions in the one or more network switches, wherein the data packets are transmitted at a priority level higher than the first priority level of the test packets (FIG. 3 real-time level 121; FIG. 5 step 506; FIG. 6 – GPS; page 8 lines 20-28).

GROUND S OF REJECTION TO BE REVIEWED ON APPEAL

37 C.F.R. § 41.37(c)(1)(vi)

Claims 1, 3, 6, 8-14, 19-21, 23, 25-30, and 33-36 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Ishioka (U.S. Patent 6,999,422) in view of Klassen et al. (U.S. Patent 6,711,137).

Claims 15-16 and 22 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Ishioka in view of Doerken et al. (U.S. publication 2004/0024550).

Claims 17 and 18 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Ishioka in view of Doerken et al. and further in view of Klassen.

Claims 31-32 and 37 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Ishioka in view of Doerken et al. and further in view of Klassen.

Claims 4-5, 7, and 24 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Ishioka in view of Klassen and further in view of Gail, Jr. et al. (U.S. Patent 7,116,639).

I. Rejections Under 35 U.S.C. § 103 – Ishioka/Klassen

Claims 1, 3, 6, 8-14, 19-21, 23, 25-30, and 33-36 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Ishioka (U.S. 6,999,422) in view of Klassen (U.S. 6,711,137). According to the Office Action, Ishioka discloses a method of transmitting packets over an IP or Ethernet packet-switched network, including steps of (1) transmitting test packets during a plurality of different time slots; (2) evaluating which of the plurality of different time slots corresponds to favorable network traffic conditions; and (3) transmitting data packets over the network using one or more favorable time slots evaluated in step (2). The Office Action admits that Ishioka fails to disclose transmitting test packets at a priority level lower than a priority level assigned to data packets and in such a way that they emulate data packets that are to be transmitted between endpoints. According to the Office Action, Klassen shows these limitations.

As the reason for combining Ishioka and Klassen, the Office Action states on page 5 that it would have been obvious to modify Ishioka “since Klassen ‘137 clearly states in column 2, lines 55-60 that such a modification to Ishioka ‘422’s system results in a better capability for testing in a network that prioritizes traffic.”

A. Improper Combination

Appellant submits that no proper reason has been shown for combining Ishioka (a system that tests different network paths to select the best-performing network path) with the network testing system of Klassen, which is limited to analyzing and tuning a communication network. The portion of Klassen relied upon in the Office Action states the following:

In addition, network traffic prioritization is currently being developed and implemented by many network equipment suppliers, who will provide prioritization by “type of service” (TOS) or “class of service bits being set in network packets’ headers. Consequently, there is a need for testing for the presence of network prioritization support and, if present, measuring network utilization and performance by means of discrete pings set at varying priorities.

This passage merely states that there is a need for testing for the presence of network prioritization support and, if present, measuring network utilization and performance by means of discrete pings set at varying priorities. Ishioka does not even mention the word “priority,” so the suggestion that Klassen’s system would be desirable or needed for the non-prioritized transmission system of Ishioka is in error. Nothing in Klassen refers to Ishioka or the type of system described in Ishioka. Nor does Klassen have anything to do with selecting a best path or transmission time for scheduling packets for delivery in a network. In short, there is no plausible or legally cognizable reason for combining the path-selection scheme of Ishioka with the network measurement scheme of Klassen. Accordingly, Appellant submits that the combination is not proper.

The Office Action further suggests that it would have been obvious to send test packets at a lower priority level than existing data traffic “so as not to impact existing traffic.” (Office Action at page 5). This observation relies on impermissible hindsight gleaned from Appellant’s own patent application. See page 8, lines 22-25 of the present application (“Because the higher priority level is used, the connections are not affected by test packets transmitted across the network, which are at a lower priority level.”). Such hindsight reasoning is improper.

B. Ishioka Does Not Transmit Test Packets During Different “Time Slots”

Ishioka discloses a system in which test packets are transmitted along different network paths, not during a plurality of different “time slots” as claimed. In Ishioka, the network path having the shortest delay for the test packets is used to transmit all the data packets using MPLS

tags. Data packets are not transmitted in “time slots” that were favorably determined based on the test packets, as claimed in all five independent claims (claims 1, 15, 19, 31, and 37).

Appellant has repeatedly emphasized that the term “time slot” as recited in all the independent claims has a well-known meaning in the art, and the PTO’s interpretation of the claim term “time slot” is inconsistent with that well-known meaning. This point was discussed during the March 28, 2008 interview conducted with Examiners Habte Mered, Aung Moe, and Chi Pham. At that time, Appellant provided a copy of the definition of “time slot” from the 2002 edition of the well-respected Newton’s Telecom Dictionary. That definition is again provided hereto as an appendix to this appeal brief. The definition, as of 2002, is repeated below:

Time Slot. 1. In time division multiplexing (TDM) or switching, the slot (brief moment in time) committed to a voice, data or video conversation. It can be occupied with conversation or left blank. **But the slot is always present. You can tell the capacity of the switch or the transmission channel by figuring how many slots are present.** See also TDM.

This definition is also consistent with the usage of “time slot” in the present specification. For example, page 3 lines 11-13 explains that in conventional TDM systems, “each potential transmitter on the network is guaranteed a slot of time on the network, even if that time is infrequently used.” Page 5 lines 15-27 explains that an arbitrary delivery time period (such as one second) can be decomposed into subframes each of which can be further divided “into time slots of 1 millisecond duration.” That paragraph also explains that:

“packets are assigned to one or more time slots according to this schedule for purposes of transmitting test packets and for delivering data using the inventive principles. In this sense, the scheme resembles conventional TDM systems. However, unlike TDM systems, no endpoint can be guaranteed to have a particular timeslot or timeslots. Instead, nodes on the network transmit using timeslots that are empirically determined to be favorable based on the prior transmission of test packets between the two endpoints.”

Page 6 lines 17-27 of the specification also explains how a delivery schedule can be partitioned into time slots, wherein the delivery schedule can be derived from a clock such as provided by a GPS reference. In one example, “Therefore, a period of one second would comprise 1,000 slots of 1 millisecond duration.” The notion of “time slots” is also illustrated in FIG. 4 and FIG. 6, showing how each time slot has a designated time and duration. This usage is consistent with

usage of “time slot” in other contemporaneous patents, such as U.S. Patent No. 7,317,726, issued in 2008 but filed on April 10, 2003 (issued by the same examiner assigned to this pending application). See also the definition from Wikipedia:

Time-Division Multiplexing (TDM) is a type of digital or (rarely) analog multiplexing in which two or more signals or bit streams are transferred apparently simultaneously as sub-channels in one communication channel, but physically are taking turns on the channel. The time domain is divided into several recurrent timeslots of fixed length, one for each sub-channel. A sample, byte or data block of sub-channel 1 is transmitted during timeslot 1, sub-channel 2 during timeslot 2, etc. One TDM frame consists of one timeslot per sub-channel. After the last sub-channel the cycle starts all over again with a new frame, starting with the second sample, byte or data block from sub-channel 1, etc.

Page 3 of the Office Action asserts that Ishioka discloses that “there are 8 time slots in a 24 hour period and each time slot is a candidate time to send test packets as well as data packets.” (Pointing to col. 7 lines 45-55 of Ishioka and col. 8 line 34 of Ishioka). Here is the exact language from the cited portions of Ishioka:

Referring lastly to FIG. 6, a function of the display controller 30 will be described below. FIG. 6 shows a typical screen that the display controller 30 output to the maintenance console. This screen 300 visualizes the result of a series of packet route evaluation tests carried out for four different routes designated by route IDs #1, #2, #3, and #4. The test was conducted eight times from 0:00 a.m. at intervals of three hours, as indicated on the horizontal axis of the graph. The screen 300 summarizes the test results.

As can be seen, this passage says nothing more than that a test was conducted eight times at “intervals of three hours” and that the test results were plotted on a graph. Nothing in this paragraph refers to “time slots” as that term is understood and used in the art, or as recited in the claims. The only mention of “time slot” in Ishioka appears in col. 8 line 34:

Further, the proposed communication device conducts packet route evaluation tests on a regular basis, and displays the summarized test result on the monitor screen of a maintenance console. This feature contributes to more efficient network operations and maintenance, allowing the network operator to clearly understand the traffic condition in each time slot.

This passage does not disclose the use of “time slots” as that term is understood in the art. That paragraph merely refers to a general time of day during which aggregated traffic conditions can be “understood” by a network operator. This has nothing to do with transmitting individual packets during particular time slots that were evaluated using test packets. And the reference to a “network operator” understanding traffic conditions does not disclose or suggest the claimed step of transmitting data packets during time slots that were evaluated as being favorable for the test packets. Nor is it consistent with TDM’s usage of “time slot” – i.e., transferring packets apparently simultaneously as sub-channels in one communication channel (see Wikipedia definition above). In short, the PTO has adopted an unreasonable and unwarranted definition of “time slot” that is contradicted by other contemporaneous evidence in the technical field.

The Advisory Action mailed on March 13, 2008 stated that “time slot is simply a time interval.” (Advisory Action of March 13, 2008, at page 4, second sentence). It is unclear what definition the Office Action is now applying. Whatever definition the PTO is relying on it is inconsistent with the usage of that term as used in the relevant technical art and the present specification. Accordingly, the cited prior art fails to show transmitting test packets over a plurality of time slots and then transmitting data packets over one or more favorable time slots evaluated in the testing step, as recited in the independent claims.

Ishioka is fundamentally different and suffers from the same problems as other prior art – all data packets in Ishioka are transmitted, at any time they arrive, over the selected route. Thus in Ishioka, packets from multiple routes can converge on the same network node, at exactly the same time, leading to packet loss. This is not the case in TDM or TDMA communication systems where time slots are assigned to prevent collisions.

Regarding independent claim 37 (addressed separately in a later section of this brief), the term “time slot” is even more precisely defined in the claim as “time slots corresponding to candidate times during which packets may be transmitted between network endpoints on the network.” Nowhere is this very specific recitation shown or disclosed in Ishioka.

C. **Ishioka Does Not Evaluate Which Time Slots Correspond to
Favorable Network Traffic Conditions and then
Transmitting During those Time Slots – Independent Claims 1 and 19**

Independent claims 1 and 19 each recite “(2) on the basis of step (1), evaluating which of the plurality of different time slots corresponds to favorable network traffic conditions” and then (3) transmitting data packets over the network . . . using one or more favorable time slots evaluated in step (2).” The Office Action takes the position that because Ishioka selects a network path having the shortest delay, this somehow correlates with evaluating time slots having favorable network traffic conditions and then transmitting during those time slots. The fact that Ishioka selects a network path does not mean that it evaluates which time slots (over any path in Ishioka’s network) are favorable and then selects those time slots for transmission.

On the top of page 3, the Office Action initially seems to take the position that transmitting during different times of the day constitutes transmission during different “time slots” – i.e., there are 8 “time slots” in a 24 hour period – yet later on page 3 the Office Action seems to switch gears and equate network path with “time slot” (“Ishioka ‘422 picks route 3 as it has the highest number of best low level contention time slots suitable for business users traffic needs”). Again, selection of a network path in Ishioka does not refer to selection of any particular time slot, whether on that network path or on a different network path. Once a path is selected in Ishioka, there is no disclosure that any particular packet will be transmitted during any particular time slot on that path. To repeat: selection of a network path does not constitute selection of any particular time slots. For this additional reason, the rejection is improper.

Independent Claim 19

Independent claim 19 recites an apparatus having a network interface and that is programmed with computer-executable instructions that, when executed, evaluate which of the plurality of different time slots corresponds to favorable network traffic conditions, and then transmitting data packets at the second priority level during one or more of the favorable time slots. There is no apparatus in Ishioka or Klassen that performs this recited function. Accordingly, the rejection of independent claim 19 on this basis should be reversed.

D. Klassen Does Not Transmit Test Packets at a Lower Priority Level Than Data Packets – Independent Claims 1, 19, (31, and 37)

As to independent claims 1, 19, 31, and 37,¹ Klassen does not disclose transmitting test packets at a lower priority level than data packets as claimed. The office action points to Klassen at col. 5 lines 1-8 which mentions nothing about priority levels. The office action also points to Klassen col. 7 at lines 18-27, but this merely discloses sending test packets at different priority levels for different types of test packets. It does not disclose sending test packets at a priority level that is lower than that of data packets transmitted between endpoints as claimed. In other words, in Klassen, test packets for data type (d) (file transfer) are sent at a lower priority level than test packets for data type (c) (interactive data), but nowhere does Klassen disclose sending the actual file transfer packets (which would constitute the “data” packets in Klassen) at a higher level priority level than the test packets for the file transfer packets. In Klassen, each category of test packet is sent at the same priority level as the data packets corresponding to that type of test packet. See Klassen at column 16 lines 54-63 (explaining that testing is performed separately “for all priorities.”)

As explained in the present specification at paragraph 32 as originally filed (now paragraph 36 as published) and as illustrated in FIG. 7, transmitting test packets at a lower priority level than the corresponding data packets avoids interfering with existing network traffic because the lower-priority queues overflow before the higher-priority queues – in other words, the test packets do not exacerbate network loading problems. In short, Klassen does not disclose or suggest using low-priority packets to test for the existence of congestion of high-priority packets.

Page 5 of the Office Action states that it would have been obvious to send test packets at a lower priority level than existing data traffic “so as not to impact existing traffic.” The Office Action improperly relies on hindsight gleaned from the present patent application. As explained in paragraph 36 of the present specification (as published), “Because the higher priority level is used, the connections are not affected by test packets transmitted across the network which are at

¹ Independent claims 31 and 37 were not rejected based on Ishioka and Klassen, but they are included here for completeness of the argument. They are separately addressed later in this brief under the combination under which they were rejected.

a lower priority level.” The Office Action has now taken the inventor’s own patent specification and used it as the basis for providing a reason to combine Ishioka and Klassen. Such hindsight reconstruction is impermissible.

E. Klassen Does Not Transmit Test Packets at a Data Rate That Emulates Data Packets – Independent Claims 19 (and 37)

Independent claim 19 specifically recites “transmitting a plurality of test packets . . . at a data rate that emulates data packets that are to be transmitted between endpoints on the network.” Independent claim 37² includes a similar recitation. Page 4 of the Office Action suggests that this feature is disclosed in Klassen in col. 5 (lines 5-8); col. 6 (lines 41-55); and col. 7 (lines 1-17). Appellant has carefully reviewed these portions of Klassen but respectfully disagrees. Column 5 lines 5-8 merely explains that “subjects for probative testing are for the four principle [sic] types of network traffic, which are (1) voice/video, (2) client/server transaction, (3) web browser, and (4) batch file, print, and fax.” This section clearly says nothing about data rates but merely describes testing different categories of traffic. Column 6 at lines 41-55 similarly merely mentions testing different categories of traffic but does not mention or suggest testing data rates for data packets. Finally, column 7 lines 1-17 merely discusses sending various types of traffic, although some of the tests are described as varying the packet size for the traffic. Taken collectively, nothing in Klassen discloses the claimed feature of transmitting test packets at a data rate that emulates later-transmitted data packets. Unless test packets are sent at a data rate that emulates the later-transmitted data packets, one would have no way of knowing whether a particular time slot or time slots could handle the traffic expected to be transmitted.

F. Ishioka Does Not Schedule Packets for Transmission Within Time Slots Within a Frame that is Synchronized to a Clock – Claims 9 and 27

Dependent claims 9 and 27 recite that the IP packets “are scheduled for transmission within time slots within a frame that is synchronized to a clock.” Page 7 of the Office Action states that Ishioka discloses this feature in col. 6 lines 60-67 and col. 7 lines 45-55 and in FIG. 6. Appellant respectfully disagrees.

² Independent claim 37 was not rejected based solely on Ishioka and Klassen, but it is discussed here for completeness of the argument.

First, there is no “scheduling” of packets at all in Ishioka. Instead, packets are merely transmitted when they are ready to be transmitted without regard to a schedule. They are then transmitted on the selected route, but they are not “scheduled” for any particular time on that route. Hence, the concept of scheduled packet transmission is completely missing from Ishioka.

Second, there is no concept of scheduling IP packets for transmission within time slots within a frame that is synchronized to a clock are recited in claims 9 and 27. Nowhere does Ishioka mention time slots within a frame, let alone synchronization of the frame to a clock. In fact, on page 18 the Office Action concedes that Ishioka does not disclose synchronous transmission of packets, thus necessitating the combination of Ishioka with Doerkin. As to the portions of Ishioka relied upon in the Office Action, column 6 at lines 60-67 merely describes sending test packets and using a reception timer, and column 7 at lines 45-55 merely describes the test results depicted in FIG. 6 – there is no description of scheduling IP packets within time slots within a frame synchronized to a clock as claimed. Where is the “frame” of time slots and to what clock has such a frame been synchronized?

Dependent Claim 27

Dependent claim 27 depends from independent apparatus claim 19, which recites “an apparatus having a network interface and programmed with computer-executable instructions that, when executed, perform the steps of . . . transmitting data packets” . . . (dependent claim 27 – “wherein the IP packets are scheduled for transmission within time slots within a frame that is synchronized to a clock.”). There is no programmed apparatus in either Ishioka or Klassen that performs this packet “scheduling” function. Accordingly, the rejection of dependent claim 27 is improper for this additional reason.

G. Three-Level Priority Scheme – Dependent Claims 10 and 28

Dependent claims 10 and 28 recite transmitting test packets at a priority level that is lower than the data packets but higher than other data packets containing other data transmitted on the network. In other words, there are at least three priority levels assigned to the packets as follows: (1) data packets; (2) test packets (lower priority than (1)); and (3) other data packets (lower priority than (2)). Page 7 of the Office Action points to Klassen at various places where this feature is allegedly taught. However, as pointed out above, nowhere does Klassen disclose sending test packets at a priority level that is lower than the data packets – in Klassen both the

test packets and the data packets are transmitted at the same priority level. The fact that Klassen discloses different types of packets in column 7 lines 1-17 at different priority levels does not mean that the three-level priority scheme recited in dependent claims 10 and 28 is disclosed or suggested.

II. Rejections Under 35 U.S.C. § 103 – Ishioka/Doerken

Claims 15-16 and 22 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Ishioka (U.S. 6,999,422) in view of Doerken (U.S. 2004/0024550). According to the Office Action, Ishioka discloses all the elements of these claims, except for synchronous transmission from the first network endpoint to a second network endpoint, a feature that is purportedly shown by Doerken.

As to independent claim 15, pages 17-18 of the Office Action state that Ishioka discloses the recited step of establishing a time reference frame comprising a plurality of “time slots” (eight “time slots” in a 24-hour period) and “empirically determining” which of the plurality of time slots is associated with a reduced level of packet contention.

First, as to the claimed time reference frame comprising a plurality of “time slots,” the definition of “time slot” as discussed extensively above is incorporated herein. That is, “time slot” as used in the claims does not refer to some generalized notion of the time of day. Moreover, there is no mention or suggestion in Ishioka of establishing a “frame” made up of a plurality of “time slots” as recited in claim 15.

Second, the system of Ishioka does not “empirically determine” which of a plurality of time slots is associated with a reduced level of packet contention – at most, Ishioka selects the network path that is associated with a lower latency. But there is no association between network path and time slots – packets are transmitted when they are received; they are not associated with any particular time slots. In Ishioka there is no association between packet contention with respect to an intended second network endpoint as claimed. The Office Action states on page 18 that the low contention time slots of Ishioka “are the ones that have the minimum relative delay or transport time as shown in Figure 6.”

Even assuming that the three-hour “test times” shown in FIG. 6 were considered to constitute “time slots” – a point disputed by Appellant – nowhere in Ishioka are those “time slots” used as the basis for transmitting data packets between endpoints. For example, if the test

that was run at time 0:00 in FIG. 6 is treated as a first “time slot” and the test that was run at the other times are treated as different “time slots,” nowhere does Ishioka disclose or suggest using the test time as the basis for transmitting data packets during that test time. Instead, Ishioka only selects a network path, which as can be seen is not a test time. The fact that multiple tests were run at different times over different network paths does not convert Ishioka into a time slot-based testing system – it still only selects a path, not a time for transmitting the packets.

III. Rejections Under 35 U.S.C. § 103 – Ishioka/Doerken/Klassen

Dependent claims 17 and 18 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Ishioka (U.S. 6,999,422) in view of Doerken (U.S. 2004/0024550) and further in view of Klassen ‘137.

As explained above, the proposed reason for modifying Ishioka with Klassen is not valid, and the arguments regarding this improper combination are incorporated herein.

Dependent Claim 17

As to dependent claim 17, which recites transmitting test packets at a lower priority level than the packet priority level used to transmit the plurality of data packets, the Office Action relies on the same portions of Klassen discussed above with respect to independent claim 1. The arguments set forth above with respect to Klassen’s priority scheme are incorporated herein and are applicable to the rejection of claim 17.

Dependent Claim 18

As to dependent claim 18, which recites transmitting test packets at a data rate sufficient to support a desired bandwidth in step (3) (i.e. the step during which the data packets are transmitted), the Office Action relies on Klassen column 7 at line 6 (which merely mentions sending echo or discard packets of different lengths isolated from one another by fixed intervals) and column 7 lines 53-55 (which merely describes determining network utilization at different priority levels and then deriving predictive results for current and future response time and window sizes for different types of service). Nowhere is any bandwidth mentioned or suggested in these portions of Klassen. In fact, Klassen states that the test packets are isolated from one another by fixed intervals (col. 7 line 7), suggesting that packets are always sent at the same rate. Appellant does not see how this constitutes sending the packets at a data rate sufficient to support a desired bandwidth as claimed in dependent claim 18.

IV. Rejections Under 35 U.S.C. § 103 – Ishioka/Klassen/Doerken

Claims 31, 32, and 37 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Ishioka (U.S. 6,999,422) in view of Klassen '137 and further in view of Doerken (U.S. 2004/0024550). According to the Office Action (pages 22-26), the combination of Ishioka and Klassen disclose all of the features of independent claim 31 except for the synchronous transmission of data packets, which it contends is disclosed by Doerken. As the reason for combining Ishioka and Klassen, the Office Action states on pages 26 and 31 that it would have been obvious to modify Ishioka "since Klassen '137 clearly states in column 2, lines 55-60 that such a modification to Ishioka '422's system results in a better capability for testing in a network that prioritizes traffic."

Appellant submits that no proper reason has been shown for combining Ishioka (a system that tests different network paths to select the shortest network path) with the network testing system of Klassen, which is limited to analyzing and tuning a communication network. The portion of Klassen relied upon in the Office Action states the following:

In addition, network traffic prioritization is currently being developed and implemented by many network equipment suppliers, who will provide prioritization by "type of service" (TOS) or "class of service bits being set in network packets' headers. Consequently, there is a need for testing for the presence of network prioritization support and, if present, measuring network utilization and performance by means of discrete pings set at varying priorities.

This passage merely states that there is a need for testing for the presence of network prioritization support and, if present, measuring network utilization and performance by means of discrete pings set at varying priorities. Nothing in Klassen refers to Ishioka or the type of system described in Ishioka. Nor does Klassen have anything to do with selecting a best path or transmission time for scheduling packets for delivery in a network. In short, there is no plausible or legally cognizable reason for combining the path-selection scheme of Ishioka with the network measurement scheme of Klassen. Accordingly, Appellant submits that the combination is not proper.

Even if combined as proposed, numerous limitations of these claims would not be shown by the combination.

The arguments above regarding the definition of “time slot” are hereby incorporated by reference and apply to the rejection of independent claims 31 and 37.

The arguments above regarding Ishioka’s and Klassen’s failure to evaluate which “time slots” correspond to favorable network traffic conditions (independent claim 31) or contention conditions (independent claim 37) are incorporated by reference and applies to these two independent claims.

The arguments above regarding the claimed priority levels as compared to Klassen is hereby incorporated by reference and applies to the rejection of independent claims 31 and 37.

Independent Claim 31

Independent claim 31 recites “A system comprising at least three network endpoints . . . each endpoint comprising a processor programmed with computer-executable instructions that, when executed, perform steps including . . . evaluating which of the plurality of different time slots corresponds to favorable network traffic conditions; and (3) synchronously transmitting data packets over the network using one or more favorable time slots evaluated in step (2).” There is no structure in Ishioka, Klassen, or Doerken corresponding to this processor programmed to carry out the recited steps. Accordingly, the rejection of independent claim 31 is improper for this additional reason.

Independent Claim 37

First, as to the claimed time reference frame comprising a plurality of “time slots,” the definition of “time slot” as discussed extensively above is incorporated herein. That is, “time slot” as used in the claims does not refer to some generalized notion of the time of day. Moreover, there is no mention or suggestion in Ishioka of establishing a “time reference frame” made up of a plurality of “time slots” as recited in claim 37.

Additionally, the term “time slot” is expressly defined in the claim as “time slots corresponding to candidate times during which packets may be transmitted between network endpoints on the network.” Page 28 of the Office Action takes the position that because Ishioka discloses eight different test that were run (as shown in FIG. 6), the time that each test was conducted constitutes a “time slot” and that there are 8 such “time slots” in a 24-hour period. But that does not turn the “test times” of Ishioka into the claimed time slots, which are “candidate times during which packets may be transmitted between network endpoints on the

network.” Later independent claim 37 recites “synchronously transmitting based on the time reference frame a plurality of data packets . . . during the one or more of the time slots identified in step (4) that correspond to the low level of contention conditions . . .” Nowhere does Ishioka disclose or suggest transmitting packets during “test times” that correspond to a low level of contention conditions – instead, as discussed extensively above, Ishioka selects the network path having the lowest packet latency. Selecting a network path does not constitute selecting a “time slot” – or “test time” as the Office Action has treated the test results of FIG. 6 of Ishioka. If that were true, Ishioka would select a transmission time from FIG. 6 without regard to network path – i.e., it would select the “test time” of 0:00 (zero delay), or 3:00 (zero delay), or 6:00 (zero delay). But nowhere does Ishioka suggest scheduling packets for transmission at any particular time based on the testing.

Page 30 of the Office Action states, “see column 7, lines 45-55 where Ishioka ‘422 picks route 3 as it has the highest number of best low level contention time slots suitable for business users traffic needs.” There are two problems with this statement. First, nowhere does Ishioka pick a route based on the “highest number of best low level contention time slots” or anything close to it. The cited portion, referring to FIG. 6, discusses the functions of a maintenance console 30 illustrated in FIG. 1. As explained previously in Ishioka at column 3 lines 37-47, the transport time evaluation unit calculates the difference between transmission times of a single test packet transmitted over each of a plurality of different paths and then selects the best path. After the best path has already been selected, “the transmission testing unit 10 supplies its evaluation test result also to the display controller 30, allowing it to display the information on the monitor screen of a maintenance console that is attached to the communication device 1.” In other words, a single test packet is transmitted over each route (col. 3 lines 21-25, produces n test packets when there are n routes) and the system picks the single route that is the shortest. Second, only one route is selected – the shortest one. There is no selection of any “time” at all. For these reasons, the rejection of independent claim 37 is improper.

Also as to independent claim 37, which recites transmitting test packets “at a data rate corresponding to an expected rate to be experienced during a subsequent communication between the first and second endpoints on the IP network,” page 30 of the Office Action points to Klassen in column 5 (lines 5-8), column 6 (lines 41-55), and column 7 (lines 1-17 and 53-55).

Column 5 lines 5-8 and column 6 lines 41-55 of Klassen merely describes testing for different types of network traffic without regard to any data rate for a subsequent communication. Column 7 lines 1-17 mentions testing various types of packets, but does not mention or suggest anything to do with data rates. And column 7 lines 53-55 mentions “deriving predictive results for current and future response times” but says nothing about data rates. Accordingly, Appellant submits that this limitation is not found even if the references were combined as proposed.

Moreover, Klassen does not disclose transmitting test packets at a lower priority level than data packets as claimed. The office action points to Klassen at col. 5 lines 1-8 which mentions nothing about priority levels. The office action also points to Klassen col. 7 at lines 18-27, but this merely discloses sending test packets at different priority levels for different types of test packets. It does not disclose sending test packets at a priority level that is lower than that of data packets transmitted between endpoints as claimed. In other words, in Klassen, test packets for data type (d) (file transfer) are sent at a lower priority level than test packets for data type (c) (interactive data), but nowhere does Klassen disclose sending the actual file transfer packets (which would constitute the “data” packets in Klassen) at a higher level priority level than the test packets for the file transfer packets. In Klassen, each category of test packet is sent at the same priority level as the data packets corresponding to that type of test packet. See Klassen at column 16 lines 54-63 (explaining that testing is performed separately “for all priorities.”)

As explained in the present specification at paragraph 32 as originally filed (now paragraph 36 as published) and as illustrated in FIG. 7, transmitting test packets at a lower priority level than the corresponding data packets avoids interfering with existing network traffic because the lower-priority queues overflow before the higher-priority queues – in other words, the test packets do not exacerbate network loading problems. In short, Klassen does not disclose or suggest using low-priority packets to test for the existence of congestion of high-priority packets.

Page 5 of the Office Action states that it would have been obvious to send test packets at a lower priority level than existing data traffic “so as not to impact existing traffic.” The Office Action improperly relies on hindsight gleaned from the present patent application. As explained in paragraph 36 of the present specification (as published), “Because the higher priority level is

used, the connections are not affected by test packets transmitted across the network which are at a lower priority level.” The Office Action has now taken the inventor’s own patent specification and used it as the basis for providing a reason to combine Ishioka and Klassen. Such hindsight reconstruction is impermissible.

V. Rejections Under 35 U.S.C. § 103 – Ishioka/Klassen/Gail

Claims 4, 5, 7, and 24 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Ishioka (U.S. 6,999,422) in view of Klassen ‘137 and further in view of Gail (U.S. 7,116,639). According to the Office Action (pages 33-38), the combination of Ishioka and Klassen disclose most of what is recited in these claims, and that the remaining features are disclosed in Gail.

The arguments above regarding the improper combination of Ishioka with Klassen are incorporated herein. Because there is no legally cognizable basis for modifying the path-selection system of Ishioka with the network measurement system of Klassen, the added combination of Gail is also not a proper combination.

CONCLUSION

For all of the foregoing reasons, Appellant respectfully submits that the final rejection of claims 1 and 3-37 is improper and should be reversed.

Respectfully submitted,
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CLAIMS APPENDIX
37 C.F.R. § 41.37(c)(1)(viii)

Claims involved in the appeal:

1. A method of transmitting packets over an Internet Protocol (IP) or Ethernet packet-switched network, comprising the steps of:

(1) transmitting a plurality of test packets over the network during a plurality of different time slots, wherein each test packet has a priority level that is lower than a priority level assigned to data packets that are to be transmitted between endpoints on the network, and wherein the test packets are transmitted so as to emulate data packets that are to be transmitted between the endpoints on the network;

(2) on the basis of step (1), evaluating which of the plurality of different time slots corresponds to favorable network traffic conditions; and

(3) transmitting data packets over the network at a priority level higher than the test packets using one or more favorable time slots evaluated in step (2).

3. The method of claim 1, wherein step (2) comprises the step of evaluating packet latencies associated with the test packets.

4. The method of claim 1, wherein step (2) comprises the step of evaluating dropped packet rates associated with the test packets.

5. The method of claim 1, wherein step (1) comprises the step of transmitting the test packets at a data rate corresponding to an expected connection bandwidth.

6. The method of claim 1, wherein step (2) comprises the step of a network endpoint performing an evaluation of packet statistics associated with the test packets transmitted over the plurality of different time slots.

7. The method of claim 1, wherein step (2) comprises the step of a network endpoint performing an evaluation of latencies and dropped packet rates associated with the test packets transmitted over the plurality of different time slots.

8. The method of claim 1, wherein the test packets and the data packets comprise Internet Protocol (IP) packets transmitted over a packet-switched network.

9. The method of claim 8, wherein the IP packets are scheduled for transmission within time slots within a frame that is synchronized to a clock.

10. The method of claim 1, wherein the test packets are transmitted at a priority level that is lower than the data packets in step (3), but higher than other data packets containing other data transmitted on the network.

11. The method of claim 1, wherein the data packets comprise voice data.

12. The method of claim 1, further comprising the step of repeating steps (1) through (3) for each side of a two-way connection between two endpoints in the network.

13. The method of claim 1, wherein the network is a packet-switched network comprising packet switches that maintain packet queues.

14. The method of claim 13, wherein each packet switch comprises at least two packet queues, a higher-priority queue for transmitting the data packets of step (3) and a lower-priority queue for transmitting the test packets of step (1).

15. In an Internet Protocol (IP) or Ethernet network comprising a plurality of packet switches, a method of transmitting data packets, comprising the steps of:

(1) establishing a time reference frame comprising a plurality of time slots during which packets are to be transmitted across the network between two network endpoints;

(2) from a first network endpoint, empirically determining which of the plurality of time slots is associated with a reduced level of packet contention with respect to an intended second network endpoint; and

(3) synchronously transmitting a plurality of data packets from the first network endpoint to the second network endpoint during one or more time slots empirically determined to be associated with the reduced level of packet contention in step (2).

16. The method of claim 15, wherein step (2) comprises the step of transmitting a plurality of test packets during a plurality of different time slots from the first network endpoint to the second network endpoint.

17. The method of claim 16, wherein step (2) comprises the step of transmitting the test packets using a packet priority level lower than a packet priority level used to transmit the plurality of data packets in step (3).

18. The method of claim 17, wherein step (2) comprises the step of transmitting test packets at a data rate sufficient to support a desired bandwidth in step (3).

19. An apparatus having a network interface and programmed with computer-executable instructions that, when executed, perform the steps of:

(1) transmitting a plurality of test packets at a first priority level, wherein the test packets are transmitted at a data rate that emulates data packets that are to be transmitted between endpoints on the network;

(2) on the basis of step (1), evaluating which of the plurality of different time slots corresponds to favorable network traffic conditions; and

(3) transmitting data packets over the network at a second priority level using one or more favorable time slots evaluated in step (2), wherein the second priority level is higher than the first priority level.

20. The apparatus of claim 19, wherein the computer-executable instructions further perform the step of evaluating packet latencies of the plurality of test packets with a second apparatus connected to the network.

21. The method of claim 1, wherein step (2) comprises the step of transmitting the test packets at a data rate that exceeds an expected data rate for packets that are to be transmitted between two network endpoints on the network.

22. The method of claim 15, wherein the reduced level of packet contention corresponds to zero contention.

23. The apparatus of claim 19, wherein step (2) comprises the step of evaluating packet statistics associated with the test packets.

24. The apparatus of claim 23, wherein the packet statistics comprise a dropped packet rate.

25. The apparatus of claim 23, wherein the packet statistics comprise packet latencies.

26. The apparatus of claim 19, wherein the test packets and the data packets comprise Internet Protocol (IP) packets transmitted over a packet-switched network.

27. The apparatus of claim 26, wherein the IP packets are scheduled for transmission within time slots within a frame that is synchronized to a clock.

28. The apparatus of claim 19, wherein the test packets are transmitted at a priority level that is lower than the data packets in step (3), but higher than other data packets containing other data transmitted on the network.

29. The apparatus of claim 19, wherein the data packets comprise voice data.

30. The apparatus of claim 19, wherein the network is a packet-switched network comprising packet switches that maintain packet queues.

31. A system comprising at least three network endpoints that contend for resources in a shared packet switch, each endpoint comprising a processor programmed with computer-executable instructions that, when executed, perform steps including:

(1) transmitting a plurality of test packets over the network during a plurality of different time slots, wherein each test packet has a priority level that is lower than a priority level assigned to data packets that are to be transmitted between endpoints on the network, and wherein the test packets are transmitted so as to emulate data packets that are to be transmitted between the endpoints on the network;

(2) on the basis of step (1), evaluating which of the plurality of different time slots corresponds to favorable network traffic conditions; and

(3) synchronously transmitting data packets over the network using one or more favorable time slots evaluated in step (2).

32. The system of claim 31, wherein the processor is further programmed to perform steps including:

evaluating packet statistics corresponding to the test packets transmitted as part of step (2).

33. The method of claim 1, wherein the data packets comprise video data.

34. The method of claim 1, wherein the data packets comprise time-division multiplex (TDM) data converted into IP packets.

35. The apparatus of claim 19, wherein the data packets comprise video data.

36. The apparatus of claim 19, wherein the data packets comprise time-division multiplex (TDM) data converted into IP packets.

37. A method of transmitting packets over an Internet Protocol (IP) network comprising a plurality of network switches, comprising:

(1) establishing a time reference frame comprising a plurality of time slots corresponding to candidate times during which packets may be transmitted between network endpoints on the network;

(2) transmitting over a plurality of the time slots a plurality of test packets from a first endpoint on the IP network to a second endpoint on the IP network, wherein the plurality of test packets are transmitted at a first priority level and are transmitted at a data rate corresponding to an expected rate to be experienced during a subsequent communication between the first and second endpoints on the IP network,

(3) evaluating, at one of the first and second endpoints, packet statistics for the test packets, wherein the packet statistics are indicative of contention conditions in one or more of the plurality of network switches,

(4) identifying one or more time slots that correspond to a low level of contention conditions; and

(5) synchronously transmitting based on the time reference frame a plurality of data packets comprising one or more of voice data, video data, and TDM-over-IP data during the one or more of the time slots identified in step (4) that correspond to the low level of contention conditions in the one or more network switches, wherein the data packets are transmitted at a priority level higher than the first priority level of the test packets.

EVIDENCE APPENDIX

37 C.F.R. § 41.37(c)(1)(ix)

Attached is the definition of “time slot” taken from the 2002 edition of Newton’s Telecom Dictionary, a highly-respected dictionary relied upon in the telecommunications industry.

NEWTON's TELECOM DICTIONARY

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RELATED PROCEEDINGS APPENDIX

37 C.F.R. § 41.37(c)(1)(x)

NONE.